SPECIAL OBSERVATIONS.

HALO PHENOMENA OBSERVED DURING JUNE, 1919.

By WILLIS RAY GREGG, Meteorologist.

Station.	Altitude.	Latitude.	Longitude.	Date.	Form observed.	Time of—		Theodolite readings.					
						Beginning.	Ending.	Time.	Radius inside.	Radius outside.	Length of arc.	Distance from sun or moon.	Altitude of sun or moon.
	m.	° ′	° ′						°	°	°	°	°
Broken Arrow, Okla.*	233	36 02	95 49	8	Circumzenithal arc	7:00 a. m.	7:14 a. m.	7:12 a. m.			7		22.6
				19	Solar halo, 22°	2:45 p. m.	3:00 p. m.						
				24	Solar halo, 22°	6:40 p. m.	7:30 p. m.						
				24	Parhelion, 22°, right	6:40 p. m.	7:30 p. m.						
				24	Parhelion, 22°, left	6:40 p. m.	7:30 p. m.						
Canton, N. Y.	137	44 36	75 10	12	Lunar halo, 22°	10:00 p. m.							
				13	Solar halo, 22°	10:00 a. m.	11:30 a. m.						
				24	Solar halo, 22°	2:10 p. m.	3:00 p. m.						
				30	Solar halo, 22°	7:40 a. m.	11:00 a. m.						
Cincinnati, Ohio	191	39 06	84 30	19	Parhelion, 22°, left	5:54 p. m.	5:58 p. m.						
Dayton, Ohio	274	39 46	84 10										
Drexel, Nebr.*	306	41 20	96 16	2	Solar halo, 22°	3:05 p. m.	4:10 p. m.	3:15 p. m.	22	23	180		47
Ellendale, N. Dak.*	444	45 59	98 34	3	Solar halo, 22°	11:45 a. m.	12:55 p. m.	12:36 p. m.	21.5	22.5	360		66
				14	Solar halo, 22°	10:30 a. m.	1:15 p. m.						
				15	Solar halo, 22°	6:45 a. m.	8:10 a. m.						
				26	Solar halo, 22°	6:30 a. m.	7:15 a. m.	7:05 a. m.	22	23	190		
Groesbeck, Tex.*	141	31 30	96 28	9	Solar halo, 22°	1:07 p. m.	2:42 p. m.	1:19 p. m.	21.5	23.5	360		74.5
Leesburg, Ga.*	85	31 47	84 14	2	Solar halo, 22°	2:50 p. m.	3:10 p. m.	2:50 p. m.	22		110		
				8	Lunar halo, 22°	8:45 p. m.	D. n. p. m.	9:00 p. m.	22		270		
				11	Solar halo, 22°	11:55 a. m.	12:10 p. m.	12:05 p. m.	22		180		
				11	Lunar halo, 22°	8:30 p. m.	D. n.	8:40 p. m.	22		290		
				12	Solar halo, 22°	3:20 p. m.	5:40 p. m.	3:25 p. m.	22		330		40
				12	Parhelion, 22°, right	5:23 p. m.	5:38 p. m.	5:31 p. m.				225	19
				12	Parhelion, 22°, left	5:23 p. m.	5:40 p. m.	5:30 p. m.				23	19
				13	Solar halo, 22°	2:47 p. m.	2:50 p. m.	2:47 p. m.	22		270		
				17	Solar halo, 22°	3:56 p. m.	4:10 p. m.	3:56 p. m.	22		150		
				19	Solar halo, 22°	7:05 p. m.	7:15 p. m.	7:10 p. m.	22		180		32
				20	Solar halo, 22°	6:30 a. m.	6:50 a. m.	6:35 a. m.	22		180		
				20	Lunar halo, 22°	12:30 a. m.	D. n. a. m.	12:30 a. m.	22		180		
				26	Solar halo, 22°	12:00 m.	12:30 p. m.	12:04 p. m.	22		360		78
				28	Solar halo, 22°	6:50 a. m.	7:20 a. m.	6:55 a. m.	22		90		
				28	Solar halo, 22°	7:38 a. m.	7:50 a. m.	7:40 a. m.	22		65		
Madison, Wis.	297	43 05	89 23	7	Solar halo, 22°	6:25 p. m.	6:40 p. m.						
				9	Solar halo, 22°	4:24 p. m.	5:00 p. m.						
				10	Solar halo, 22°	8:15 a. m.	1:00 p. m.						
				11	Solar halo, 22°	5:45 a. m.	6:30 a. m.						
				11	Solar halo, 22°	9:30 a. m.	12:00 m.						
				14	Solar halo, 22°	2:30 p. m.							
				15	Solar halo, 22°	3:15 p. m.	6:10 p. m.						
				16	Solar halo, 22°	7:20 a. m.	2:00 p. m.						
				16	Parhelion, 22°, left	6:40 p. m.	6:48 p. m.						
				21	Solar halo, 22°	6:30 a. m.	8:00 a. m.						
				30	Solar halo, 22°	1:00 p. m.	4:00 p. m.						
Nashville, Tenn.	166	36 10	86 47	25	Solar halo, 22°	3:30 p. m.	4:15 p. m.	3:45 p. m.					
Royal Center, Ind.*	225	40 53	86 20										
Tatoosh Island, Wash.	26	48 23	124 44	1	Solar halo, 22°	10:20 a. m.	4:30 p. m.						
				3	Solar halo, 22°	12:57 p. m.	4:50 p. m.						
				4	Solar halo, 22°	8:28 a. m.	9:00 a. m.						
				4	Parhelion, 22°, right	6:27 p. m.	6:35 p. m.						
				4	Parhelion, 22°, left	5:26 a. m.	5:30 a. m.						
				7	Solar halo, 22°	11:16 a. m.	11:30 a. m.						
				7	Solar halo, 22°	2:26 p. m.	7:00 p. m.						
				7	Parhelion, 22°, left	6:50 p. m.	7:00 p. m.						
				10	Solar halo, 22°	2:06 p. m.	3:00 p. m.						
				13	Solar halo, 22°	2:29 p. m.	7:10 p. m.						
				16	Solar halo, 22°	3:20 p. m.	7:15 p. m.						
				16	Parhelion, 22°, right	5:52 p. m.	7:10 p. m.						
				16	Parhelion, 22°, left	4:44 p. m.	5:07 p. m.						
				16	Upper tangent arc	4:44 p. m.	5:07 p. m.						
				16	Lower tangent arc	4:44 p. m.	4:50 p. m.						
				17	Solar halo, 22°	10:35 a. m.	7:55 p. m.						
				17	Parhelion, 22°, right	3:50 p. m.	7:15 p. m.						
				17	Parhelion, 22°, left	6:05 p. m.	7:15 p. m.						
				17	Upper tangent arc	3:55 p. m.	6:45 p. m.						
				17	Lower tangent arc	3:50 p. m.	4:30 p. m.						
				17	Circumscribed halo	2:00 p. m.	2:30 p. m.						
				17	Solar halo, 46°	3:20 p. m.	4:30 p. m.						
				17	Circumzenithal arc	6:05 p. m.	6:15 p. m.						
				17	Light pillar	7:35 p. m.	8:10 p. m.						
				18	Solar halo, 22°	5:20 a. m.	6:42 a. m.						
				18	Parhelion, 22°, right	5:26 a. m.	6:42 a. m.						
				18	Parhelion, 22°, left	5:26 a. m.	5:33 a. m.						
				18	Upper tangent arc	5:29 a. m.	5:33 a. m.						
				18	Light pillar	4:19 a. m.	4:50 a. m.						
				19	Solar halo, 22°	2:23 p. m.	3:00 p. m.						
				20	Solar halo, 22°	5:29 a. m.	12:30 p. m.						
				20	Parhelion, 22°, right	6:02 a. m.	8:30 a. m.						
				20	Parhelion, 22°, left	6:02 a. m.	8:30 a. m.						
				20	Upper tangent arc	9:25 a. m.	10:00 a. m.						
				24	Solar halo, 22°	8:48 a. m.	12:40 p. m.						
				24	Parhelion, 22°, right	8:48 a. m.	9:35 a. m.						
				24	Parhelion, 22°, left	8:48 a. m.	9:45 a. m.						
				24	Solar halo, 46°	8:48 a. m.	9:10 a. m.						
				24	Parhelic circle	8:48 a. m.	9:22 a. m.						
				24	Paranthelion, 120° right	8:48 a. m.	8:57 a. m.						
				24	Paranthelion, 120°, left	8:48 a. m.	8:57 a. m.						
				24	Solar halo, 22°	3:40 p. m.	7:05 p. m.						
				24	Parhelion, 22°, right	4:12 p. m.	7:05 p. m.						
				24	Parhelion, 22°, left	4:12 p. m.	7:05 p. m.						
				25	Solar halo, 22°	11:00 a. m.							
				25	Parhelion, 22°, right	7:04 p. m.							
				25	Parhelion, 22°, left	7:04 p. m.							
				26	Solar halo, 22°	8:51 a. m.	9:00 a. m.						
				27	Solar halo, 22°	1:31 p. m.	2:15 p. m.						
York, N. Y.‡	232	42 52	77 53	11	Solar halo, 22°	11:30 a. m.	2:00 p. m.	12:40 p. m.			360		
				29	Solar halo, 22°	11:30 a. m.	6:15 p. m.	12:30 p. m.			360		

*Aerological station.

‡ Taken at Rochester, N. Y.

Halo phenomena observed during June, 1919—Continued.

Station.	Date.	Colors.†	Degree of brightness.	Clouds.			Station. pressure.	Precipitation.	
				Amount.	Kind.	Direction.		Last previous ended.	First subsequent began.
Broken Arrow, Okla.*	8	R. G. Y. O. R.	Bright	Few 4	Ci.St. St.Cu.	ssw.	Rising	D. N., a., 7th	7:04 a. m., 8th.
	19	R.	Dim	Few	Ci.St.	w.	Falling	11:25 a. m., 19th	11:33 a. m., 20th.
	24	R.	Bright	3	Ci.St.	w.	Stationary	8:00 p. m., 23d	8:20 a. m., 26th.
	24	R.	Bright						
	24	R.	Bright						
Canton, N. Y.	12	R.	Dim	3	Ci.St.	w.	Stationary	D. N., a., 10th	D. N., a., 15th.
	13	Y.	Dim	2	Ci.	nw.	Falling	D. N., a., 10th	D. N., a., 15th.
	24	R.	Dim	2	Ci. St.	w.	Falling	D. N., a., 23d	6:27 p. m., 25th.
	30	R.	Dim	2	Ci.St	w.	Falling	D. N., a., 27th	4:42 p. m., 5th.
Cincinnati, Ohio.	19		Dim	7	A. St.	ne.	Stationary	5.03 p. m., 17th	3.55 p. m., 21st.
Dayton, Ohio.									
Drexel, Nebr.*	2	O. Y. G. B.	Bright	9 Few.	Ci. St. St. Cu.	s. n.	Stationary	D. N. a., 21st	8:12 p. m., 2d.
Ellendale, N. Dak.*	3	W.	Dim	10	A. Cu.	se.	Falling	12:20 p. m., 1st	3:15 p. m., 3d.
	14		Dim				Falling	4:55 p. m., 11th	10:50 p. m., 17th.
	15		Dim	3 1	A. St. A. Cu.	s. s.	Stationary	4:55 p. m., 11th	10:50 p. m., 17th
	26	Y.	Bright	9	A. St.	s.	Stationary	11:25 a. m., 21st	8:30 p. m., 1st.
Groesbeck, Tex.*	9	R. O. Y. G.	Dim	4 2	Ci. St. St.	w. sw.	Falling	9:57 a. m., 9th	D. N., a., 10th.
Leesburg, Ga.*	2	R. O.	Bright	2 7	A. St. St. Cu.	n. nne.	Stationary	1:45 p. m., 2d	5:45 p. m., 2d.
	8	R.	Dim	8 2	Ci. St. St. Cu.	nw. ene.	Rising	6:30 a. m., 4th	10:07 a. m., 11th
	11	R. O. Y. G.	Dim	2 8	A. St. Cu.	ne. e.	Stationary	10:12 a. m., 11th	2:51 p. m., 11th.
	11	R. Y.	Dim	7 3	A. St. St. Cu.	ne. ne.	Stationary	3:01 p. m., 11th	D. N., a., 12th.
	12	R. Y.	Dim	2 3	Ci. St. A. St.	ene. ene.	Stationary	2:45 p. m., 12th	6:49 p. m., 12th.
	12	R. Y.	Dim	6	A. St.	ne.	Stationary	2:45 p. m., 12th	6:49 p. m., 12th.
	12	R. Y.	Dim	4	St. Cu.	ne.			
	13	R.	Dim	7 2	Ci. St. Cu.	w. ene.	Falling	7:38 p. m., 12th	6:15 p. m., 15th.
	17	R.	Dim	4 Few.	A. St. Cu.	nw. se.	Stationary	5:36 p. m., 16th	D. N., p., 17th.
	19	R. O. G.	Bright	3 3	Ci. St. A. Cu.	nw. e.	Stationary	D. N., a., 18th	6:16 p. m., 19th.
	20	R.	Dim	5 4	Ci. St. A. Cu.	n. n.	Stationary	6:25 p. m., 19th	
	20			10	A. St.		Stationary	6:25 p. m., 19th	
	26	R. O. Y. G.	Bright	2 2	Ci. Ci. St.	wnw. wnw.	Falling	7:10 p. m., 23d	5:37 p. m., 26th.
	26	R. Y.	Dim	2 5	Ci. St. A. Cu.	n. n.	Stationary	7:10 p. m., 23d	5:37 p. m., 26th.
	28	R. O.	Dim	4 2	Ci. St. A. Cu.	n. nw.	Stationary	6:16 p. m., 27th	1:07 p. m., 28th.
Madison, Wis.	7		Bright	4 6	Ci. St. St. Cu.		Rising	5:15 p. m., 7th	11:30 p. m., 9th.
	9	R.	Faint	10	Ci. St.	w.	Falling	5:15 p. m., 7th	11:30 p. m., 9th.
	10		Bright	6	Ci. St.	w.	Stationary	D. N., a., 10th	4:52 p. m., 10th.
	11		Dim	4 4	Ci. Ci. St.	w. w.	Stationary	D. N., p., 10th	1:25 p. m., 11th.
	11		Bright	10	Ci. St.	w.			
	14		Bright				Stationary	1:33 p. m., 14th	5:24 a. m., 16th.
	15	R.	Dim	2 5	Ci. A. St.	w. sw.	Falling	1:35 p. m., 14th	5:24 a. m., 16th.
	16		Bright	5 3	Ci. St. Cu.	w. nw.	Stationary	6:20 a. m., 16th	5:25 p. m., 16th.
	16		Bright	4 2	Ci. St. A. St.	w. w.		6:40 p. m., 16th	6:50 p. m., 16th.
	21			8 2	Ci. St. A. St.	w. e.	Stationary	5:20 p. m., 20th	9:15 p. m., 22d.
	30			8	Ci. St.	sw.	Stationary	3:33 p. m., 25th	12:35 p. m., 3d.
Nashville, Tenn.	25	R. O. Y.	Bright	3 3	Ci. St. Cu.	w. w.	Stationary	8:45 a. m., 24th	4:20 p. m., 6th.
Royal Center, Ind.*									
Tatoosh Island, Wash.	1	R. O. Y. B.	Bright	3 4	Ci. St. A. St.	w. w.	Falling	7:15 a. m., 29th	7:17 a. m., 2d.
	3		Dim	3 1	Ci. St.	w. w.	Falling	D. N., a., 3d	6:21 p. m., 8th.
	4	O.	Dim	2 1	Ci. A. Cu.	w. w.	Falling	D. N., a., 3d	6:21 p. m., 8th.
	4	R. B.	Dim	2	Ci.	w.			
	4	R. B.	Dim	7 1	Ci. Cu. St.	w. w.			
	7		Dim	4 1	Ci. St. A. St.	nw. sw.	Falling	D. N., a., 3d	6:21 p. m., 8th.
	7	O.	Dim	5 1	Ci. St. A. St.	nw. nw.	Falling	D. N., a., 3d	6:21 p. m., 8th.
	7	R. B.	Dim	7	A. St.	w.			
	10	R. B.	Dim	7 2	A. St. St.	nw. s.	Rising	12:10 p. m., 10th	D. N., p., 10th.
	13	R. O. B.	Bright	4	Ci.	s.	Rising	6:40. a. m., 13th	5:40 a. m., 14th.
	16	O.	Bright	4 1	Ci. St. St. Cu.	sw. sw.	Rising	7:55 a. m., 14th	10:50 a. m., 19th.
	16	R. O. Y. G. B. V. W.	Bright	Few.	Ci. St.				
	16	R. V.	Dim	1 Few.	Ci. St. Cu.	w. sw.			
	16	O.	Dim						
	16	O.	Dim						
	17	R. O. Y. G. B. V.	Bright	9 Few.	Ci. St. Cu.	sw. sw.	Rising	7:55 a. m., 14th	10:50 a. m., 19th
	17	R. B.	Dim						
	17	R. B.	Dim	7	Ci. St.	sw.			
	17	O. V.	Bright	8 Few.	Ci. St. Cu.	sw.			
	17	Y.	Dim						

* Aerological station. † Beginning with part nearest sun or moon. R, red; O, orange, etc.

Halo phenomena observed during June, 1919—Continued.

Station.	Date.	Colors.†	Degree of brightness.	Clouds.			Station. pressure.	Precipitation.	
				Amount.	Kind.	Direction.		Last previous ended.	First subsequent began.
Tatoosh Island, Wash. (Continued)	17	Y	Dim						
	17	R. B	Dim	8 Few.	Ci. St. Cu.	sw.			
	17	R. B	Dim						
	17	Y	Dim	3 6	Ci. St. A. St.	sw. sw.			
	18	R. Y. B	Bright	3 1	Ci. St. Ci. Cu.	s. s.	Rising	7:55 a. m., 14th	10:50 a. m., 19th.
	18	R. B. W	Bright						
	18	R. B	Dim						
	18	Y	Dim						
	18	Y	Bright	3 5	Ci. St. A. St.	s. s.			
	19	O	Dim	5 4	A. St. St.	s. s.	Rising	1:55 p. m., 19th	11:20 a. m., 21st.
	20	R. O. Y. B	Bright	8	Ci.	s.	Falling	1:55 p. m., 19th	11:20 a. m., 21st.
	20	R. Y. B	Dim						
	20	R. O. Y. G. B. V	Bright	8	Ci. St.	s.			
	20	Y	Dim	9	Ci. St.	s.			
	24	R. O. Y. G. V	Bright	5	Ci. St.	w.	Falling	10:10 a. m., 23d	4:26 a. m., 25th.
	24	R. O. V	Bright						
	24	R. O. V	Bright						
	24	R	Dim						
	24	W	Bright						
	24	W	Dim						
	24	W	Dim						
	24	O	Dim	3	Ci.	w.	Falling	10:10 a. m., 23d	4:26 a. m., 25th.
	24	R. B. W	Dim	3	Ci.	w.			
	24	R. B. W	Dim						
	24	R. O. B	Bright	9 1	A. St. St.	w. w.	Rising	5:25 a. m., 25th	10:15 a. m., 28th.
	25	R. Y. G. V	Bright	4 1	Ci. St. Cu.	s. w.			
	25	R. Y. G. V	Bright						
	26	O	Dim	2 5	Ci. St. Cu.	s. s.	Rising	5:25 a. m., 25th	10:15 a. m., 28th.
	27	R. B	Dim	7	A. St.	sw.	Falling	5:25 a. m., 25th	10:15 a. m., 28th.
York, N. Y.‡	11	R. Y	Brilliant	10	Ci. St.	nw.	Falling	1:00 p. m., 9th	4:15 p. m., 16th.
	29	R. O. Y	Brilliant	8	Ci. St.	w.	Stationary	D. N., a., 27th	5:00 p. m., 5th.

† Beginning with part nearest sun or moon. R, red; O, orange, etc. ‡ Taken at Rochester, N. Y.

MONTHLY PUBLICATION OF HALO PHENOMENA TO BE DISCONTINUED.

The foregoing table completes one year's record of halo phenomena, as observed at several well-distributed stations in the United States. In addition to a tabulation of the different forms noted, there have been included such angular measurements as could be made by means of theodolites at the six aerological stations. The purpose of this study, as outlined in the MONTHLY WEATHER REVIEW for July, 1918, pages 309–310, is to obtain a long series of reliable data from which it will be possible to determine the seasonal and latitudinal distribution of the different halo forms and to add to our knowledge concerning angular measurements, relation to types of pressure distribution, precipitation, etc. It was thought that the study should continue at least three, preferably five, years, and it was expected that brief summaries would be published in the MONTHLY WEATHER REVIEW. The continuance of this latter procedure has been found impracticable, however, owing to the large amount of data received for the limited space available in the REVIEW. In the future, therefore, the data will not be published, but they will be tabulated as heretofore at the Central Office and, when a sufficient period of observation has been covered, a general summary will be issued. It is hoped that the enthusiasm heretofore shown by the observers in this work may continue, in order that we may have as complete records as possible of "these attractive and interesting optical phenomena."—*W. R. Gregg.*

NOTES.

Mr. C. O. Schick, of the Groesbeck, Tex., Aerological Station, reports that on June 10, while traveling in northeast Texas, he observed from one side of the train a "complete and brilliant rainbow," and from the other side "a prismatically colored solar halo of [probably] 22° * * * with brilliant parhelia. * * * The arc of the halo consisted of two sections [of approximately 45° each]. The altitude of the sun was about 10° [90th meridian time]. * * * [As observed a little later] the attendant clouds were six-tenths stratus from the southeast and three-tenths cirro-stratus from the west."

UNUSUAL HALOS AT JUNEAU, ALASKA, JUNE 9, 1919.

By M. B. SUMMERS, Meteorologist.

[Dated Weather Bureau, Juneau, Alaska, June 16, 1919.]

A solar halo of unusual design that was observed at Juneau, Alaska, on the afternoon of June 9, 1919.

The phenomenon was first seen at 12 noon, 135th meridian time, at which hour it consisted solely of the ordinary 22° halo. The additional circles and arcs shown in figure 1 were not observed until 3 p. m., and reached their greatest brilliancy about 3:30 p. m. At that hour all markings in the drawing were fairly well defined except the inner oblique arcs of the anthelion, the left or northern one only being visible. The right, or southern, arc was not observed by the writer, but was seen by a re-